THE ANALYST.

APRIL, 1902.

PROCEEDINGS OF THE SOCIETY OF PUBLIC ANALYSTS.

THE monthly meeting of the Society was held on Wednesday evening, March 5, in the Chemical Society's Rooms, Burlington House. The President (Dr. J. Augustus Voelcker, M.A., B.Sc.) occupied the chair.

The minutes of the previous monthly meeting were read and confirmed.

A certificate of proposal for election to membership in favour of Dr. J. J. L. van Rijn was read for the second time; and certificates in favour of Messrs. Walter Henry Jollyman, A.I.C., analytical chemist, Laboratory of Clinical Pathology, 62, Queen Anne Street, London, W.; John T. Norman, analytical and consulting chemist, 23, Leadenhall Street, London, E.C.; John Golding, F.I.C., University College, Nottingham, assistant to Professor M. J. R. Dunstan at the Midland Dairy Institute; and William Bowen, chemist at the Erdington Works of the Nickel Company of Paris, 45, Woodend Road, Erdington, were read for the first time.

Dr. L. T. Thorne was elected a member of the Society.

The following papers were read: "The Detection of Artificial Colouring Matters in Fresh and Sour Milk," by M. Wynter Blyth, B.A., B.Sc.; "Oxidized Oils," by J. Lewkowitsch, M.A., Ph.D.; "The Indirect Estimation of Alkalies in Water," by W. W. Fisher, M.A.; and a "Note on a Simple Apparatus for Approximately Estimating the Colour of Waters," by W. T. Burgess.

The PRESIDENT, referring to the interim report recently issued by the Departmental Committee of the Board of Agriculture on Butter Regulations, said that, so far as the Society was concerned, the report was partly satisfactory and partly unsatisfactory. It was satisfactory that the recommendation of the Council of the Society to the effect that 16 per cent. was a very fair limit for water in butter had been adopted by the Departmental Committee; but the further suggestion which the report contained, that butter might be allowed to pass which contained more than 16 per cent. of water, provided that the approximate percentage of water was declared beforehand, was, the Council considered, decidedly unsatisfactory, and rendered the recommendations of the Departmental Committee on that point very weak. The Council felt that a clear statement should be issued as to the undesirability of the sale, under the name of butter, of such mixtures as that known as "milk-blended butter," which really were not of the nature, substance, and quality of true butter, but consisted of butter churned with milk or some other material, in

imitation of butter. The Council had had these matters under consideration, and had drafted a resolution embodying its views for submission to the President of the Board of Agriculture, in the hope that before any definite decision was come to he would take the whole matter into consideration and would frame such regulations as would insure that materials of the nature of "milk-blended butter" should not in the future be described and sold under that name.

NOTE ON (1) SAMPLES OF COFFEE CONTAINING ADDED STARCH; (2) A SAMPLE OF ARTIFICIAL COFFEE BERRIES.

By Cecil H. Cribb, B.Sc., F.I.C.

(*Read at the Meeting, January* 22, 1902.)

In the course of last year, amongst the samples of coffee submitted to me under the Sale of Food and Drugs Acts, there was one which, on examination, was found to contain starch. Still more recently a second sample similarly adulterated has come into my hands. Judging from official records, this kind of adulteration is extremely rare in England, and I can find no recent mention of it.

The offence is such a clumsy form of sophistication, and so easy of detection, that it would hardly seem worth while to run the risk incurred by its committal; but the occurrence of two cases in such a short time in the same district led me to think it desirable to give the matter the publicity afforded by our Journal. It is just possible that the offence occurs more frequently than is indicated by the statistics available, but owing to the adulterant occurring in coffee and chicory properly labelled as a "mixture," it may have been allowed to pass unnoticed, the analyst concluding, as did the vendor in one of the cases, that notification as a "mixture" would cover the addition of anything whatever. Of the two samples under discussion, one was actually purchased as "Coffee Mixture," the other being bought as "Coffee and Chicory." In the former case it became necessary to prove that mixed coffee meant coffee mixed with chicory, and with nothing else. As far as it was possible to ascertain, opinion in the trade was unanimous on this point, and the admixture of starch was declared to be a quite unheard-of thing. In the course of my inquiries I was given a sample of artificial coffee beans, which I was informed came over from America a few years ago, but met with no sale here. This is somewhat surprising considering the enormous extent to which coffee is adulterated in America with various mixtures, often made up into berries, consisting largely or entirely of starch. Possibly one explanation is that the sale of such a mixture is not only an offence against the Adulteration Acts, but also against the Inland Revenue Acts, which make it illegal (c. 41, s. 6) to sell, expose for sale, offer or keep ready for sale, or deliver, coffee containing anything other than chicory, unless done up in packets of a certain size and bearing a label stating the nature of the substance used and the amount of duty paid. For convenience of comparison the same analytical determinations, with one exception, have been made on each of the three samples, and the results are given in the table:

	Adulterated Coffee. 1.	2.	Artificial Coffee Beans.
Water	8·07	8·7	... 10·7
Ash	4·62	4·61	... 2·12
Soluble ash	3·56	3·30	... 1·06
Hot-water extract (Johnson's method)	39·8	31·5	... 28·0
Fat (petroleum ether extract)	7·17	7·9	... 1·43
Nitrogen	1·16	1·92	... 1·25
Caffein	—	0·95	...

In Sample No. 1 the microscope revealed only a small proportion of starch, which certainly did not exceed 5 per cent., but was far more than could be due to accident alone. It was almost entirely arrowroot, but there were also a few granules present having the characters of wheat, sago, and potato respectively. The condition of the granules pointed to their having been added after roasting.

In Sample No. 2 about 15 per cent. of starch appeared to be present, and it consisted entirely of sago. The artificial beans appeared to consist mainly of starch, probably of leguminous origin, but the granules had suffered considerably by the heat to which they had evidently been exposed.

The estimation of the starch by chemical means is a matter of some difficulty, and for the purposes of the prosecution I was content to rely mainly on the microscopical examination, comparing the sample with mixtures of known composition, made up, of course, with the same kind of starch.

The direct estimation of the starch by the diastase method after extraction with alcohol and ether would appear to be the most promising, but the process is a long and tedious one, and time has prevented me from applying it to the present samples.

In the case of Sample No. 2 a determination of the cupric reducing power of the mixture after extracting with petroleum ether, alcohol, and water (a very lengthy process when much chicory is present), and hydrolysing under pressure with hydrochloric acid, gave a figure equivalent to 16·9 per cent. of starch—a satisfactory confirmation of the amount as determined by the microscope; here, however, the sample only contained a small proportion of chicory.

With Sample No. 1 an attempt was made to shorten the process by estimating the cupric reducing power after the mixture had been heated with hydrochloric acid under pressure without previous extraction, and deducting from the figure so obtained the reducing power of the hot-water extract after the latter had been inverted by acid, but the result was hopelessly beyond the truth.

The spurious coffee berries exhibit an artful variation in shape and size, but are at once distinguished from real coffee by the absence of any remains of the "parchment" in the longitudinal groove, and also by the fact that they sink in water, whereas coffee berries float. They are free from any aniline dye and from any mineral colouring matters like venetian red.

In conclusion, I should like to suggest that local authorities might with advantage pay more attention to mixtures of coffee and chicory. On the whole, my own experience leads me to believe that intentional adulteration is extremely rare; but chicory itself is by no means above suspicion, and the attempt may at any time be made to introduce into the English market American preparations such as that just described.

Discussion.

Mr. Baker said that one large firm on the Continent, who were makers of crystal malt, made a practice of incorporating this crystal malt with a certain amount of sugar, and from 10 to 15 per cent. of coffee, the mixture being then moulded into the form of beans and sold as coffee; and he believed that a very large business was done by the firm in that particular article. Artificial coffee beans so prepared would contain no free starch, but dextrinous particles would be present, which probably would afford a ready means of recognising the article. In the course of a recent investigation he had found that the principal constituent of the coffee berry substance was a manno-arabinose or manno-xylose, which on hydrolysis yielded mannose in quantities of from 80 to 90 per cent. Chicory, he believed, yielded no mannose on hydrolysis, and possibly a quantitative estimation of coffee in a mixture of coffee and chicory might be arrived at on the basis of the amount of mannose yielded on hydrolysis, which could be readily determined by means of the hydrazone test (compare Baker and Pope, *Chem. Soc. Trans.*, 1900, vii., 704).

Mr. Hehner thought that probably a simple explanation of the occurrence of starch in the two samples referred to in the first paper might be, not that there had been deliberate adulteration, but that the mill in which the coffee had been ground had been used previously for grinding some starchy material. Such occurrences were not uncommon, and were, indeed, very apt occasionally to be met with in establishments where the appliances were not absolutely perfect.

Mr. Richmond said that a satisfactory method was much to be desired for the examination of coffee after it had been made into a beverage. The matter was a very difficult one to deal with, especially in cases in which milk had been added. He thought, however, that an idea of the volume of milk added might be obtained from the fact that milk contained a nucleo-proteid, the quantity of which could be estimated with comparative ease from a determination of phosphorus, a constituent always present in combination in such proteids. From this determination the milk-sugar could be approximately deduced, and its effect on the estimations indicating carbohydrates allowed for.

The President said that a curious method of imitating coffee berries, and also even wheat, which he had found to be practised by the natives in India, consisted simply in moulding ordinary mud into the shape of the different grains. He thought that probably Mr. Hehner's suggestion would be found to account for the presence of the starch in sample No. 1 at any rate. In sample No. 2, however, the proportion of starch—namely, 15 per cent.—seemed rather high to be accounted for in that way.

Mr. E. W. Voelcker said that, in the case of a sample which afterwards proved to have been actually ground in the presence of the Food and Drugs Inspector who purchased it, he had reported the presence of from 40 to 50 per cent. of chicory. The beans must have consisted practically of 50 per cent. of chicory and sugar with about 50 per cent. of coffee.

NOTE ON REICHARDS "SILVER" METHOD FOR THE DETERMINATION OF MORPHINE IN OPIUM.

By Philip Schidrowitz, Ph.D.

(*Read at the Meeting, January* 22, 1902.)

Reichard (*Chemiker Zeitung*, xxv., 816, 817) has devised a process for the estimation of morphine in opium, which consists essentially in the determination by weighing of the metallic silver obtained by the reducing action of the alkaloid on an ammoniacal silver chloride solution. According to Reichard, morphine is the only one of the opium alkaloids which—at any rate, under the conditions of his process—exercises a reducing action on a silver solution. Reichard further states that, if other reducing substances be present in the opium, their influence can be eliminated by precipitating the "alkaloids (morphia)" (*sic*) with ammonia, filtering, treating the filtrate with ammoniacal silver chloride, weighing the reduced silver, and subtracting the weight so obtained from the gross amount. Reichard, however, states that after precipitation with ammonia he was never able to observe any reduction. Neither of these assertions bears the stamp of probability, but, owing to lack of time, I was not able to enter into this aspect of the question, but confined myself to a practical trial of the method. I found, in the first place, that if Reichard's instructions were literally followed, it was, owing to the formation of colloidal silver, practically impossible to satisfactorily wash the precipitated silver; but this difficulty was overcome by employing a 20 per cent. solution of chloride of ammonium (with the addition of a little ammonia) as wash liquor. Contrary to Reichard's experience, I found that, after precipitation with ammonia and filtration, the filtrate exercised a strong reducing action on the reagent prescribed, and here also it was necessary to make use of a liberal amount of ammonium chloride (added to the liquor before filtration) in order efficiently to filter and wash the precipitate. The sample worked on was a good average Persian opium, which had been repeatedly analysed by several of the more reliable methods, and which gave (as an average of three methods) 10·98 *per cent.* morphine. At first I worked on 5 grammes of opium, but found that the quantity of silver precipitated was too large to be conveniently handled, and the results given below were all obtained by operating on 2 grammes of the drug. The ammoniacal silver solution used contained roughly 5 per cent. AgCl, and 5 c.c. should, therefore, have (according to Reichard) been amply sufficient for a complete precipitation. The results obtained by the direct method were as follows (Table I.):

Table I.

(*Two Grammes of Opium.*)

No. of Experiment.	No. of c.c. Silver Solution.	Weight of Precipitated Silver.	= Morphine per cent.
1	5	0·15049	10·54
2	7	0·21189	14·85
3	8	0·25369	17·77
4	16	0·39609	27·75
5	30	0·29929	20·98

TABLE II.

(*Results* AFTER *Precipitation with Ammonia.*)

No. of Experiment.	No. of c.c. Silver Solution.	Weight of Precipitated Silver.
6	5	0·1459
7	10	0·2591
8	20	0·2189

Up to a certain point, therefore, it appears that the quantity of silver reduced is not dependent on the morphine contents, but rather on the quantity of silver solution employed. It is curious that in both series a very large excess of silver solution gives *lower* results than those obtained by a more moderate addition. It is obvious that in its present form, at any rate, the method is quite useless.

SPURIOUS CREAM OF TARTAR.

BY JOHN WHITE, F.I.C.

(*Read at the Meeting, January* 22, 1902.)

SOME few months ago a sample purchased as cream of tartar, and consequently labelled "Cream of Tartar," was submitted to me for analysis under the Sale of Food and Drugs Act.

The British Pharmacopœia, 1898, states that each gramme of dry cream of tartar should require for neutralization at least 5·2 c.c. of normal NaHO, which corresponds to 97·76 per cent. $KHC_4H_4O_6$. Two grammes of the sample I am describing required 9·6 c.c. normal NaHO = 4·8 for 1 gramme, corresponding, apparently, to 90·24 per cent. As shown in a paper read by A. H. Allen (ANALYST, xxi., 174), the alkalinity of the soluble ash of pure cream of tartar should be exactly equivalent to the acidity of the original substance. This sample, however, after being ignited and the ash boiled out with water, required only 1·1 c.c. normal H_2SO_4 to neutralize the solution, a result which conclusively proved it to be a fictitious article.

The sample was not completely soluble in boiling water, the solution being turbid, and a small residue remaining; this was cleared up by a little HCl. Upon testing qualitatively, reactions were obtained for lime, sulphuric and phosphoric acids, and, most surprisingly, for starch. The starch was identified by the microscope as that of rice, and finally, after comparison with known standards, I arrived at the conclusion that there was approximately 5 per cent. present.

A complete analysis of the substance was made, when the following results were obtained:

Moisture	4·10
Silica	0·30
Potassium oxide (K_2O)	15·50
Lime (CaO)	9·10
Tartaric acid ($H_2C_4H_4O_6$)	47·07
Phosphoric anhydride (P_2O_5)	6·97
Sulphuric anhydride (SO_3)	12·70
Rice starch	5·00
	100·74

The tartaric acid was estimated by a modification of Goldenberg's method, which is abstracted in the ANALYST (xxi., 333). I made some slight alterations in details, and, as the method proved to be both quick and of sufficiently practical accuracy, I state it as adopted: Two grammes of the substance are dissolved in 20 c.c. of boiling water, together with 5 c.c. of dilute HCl. The solution is made up to 100 c.c., of which 50 c.c. are made faintly alkaline by the addition of powdered K_2CO_3. Boil for two minutes, cool and make up to 100 c.c. Of this liquid, after filtration if necessary, 50 c.c. (= 0·5 gramme original substance) are transferred to a 500 c.c. flask, 10 c.c. glacial acetic acid added, and then 250 c.c. of a mixture of equal parts of alcohol 90 per cent. and ether 0·730, and the flask closed with a well-fitting cork. The whole is then well shaken, hence the use of so large a flask, and allowed to stand for about three hours, in which time the potassium hydrogen tartrate formed is completely precipitated (I believe one hour would be sufficient for the purpose). Filter, wash the precipitate with the alcohol and ether mixture until neutral to litmus, remove it from the filter, dissolve in boiling water, washing off also the adhering traces from the filter-paper, and finally titrate with $\frac{N}{10}$ NaHO. The following figures show the process to give fairly satisfactory results:

	Direct Titration.	Modified Goldenberg's Method.
Cream of tartar	98·9	99·4
Tartaric acid...	97·8	96·4

In order to ascertain whether this method would be affected by the presence of potassium hydrogen sulphate, a mixture of equal parts of cream of tartar (98 per cent.) and potassium hydrogen sulphate was examined. The result obtained was a little low, viz., 48 per cent. cream of tartar.

A consideration of the whole of the analytical results yielded by the sample points to the probability that the material was originally made by the adulteration of cream of tartar with bone-ash superphosphate and starch. The amount of K_2O present is equal to 62 per cent. of cream of tartar. Assuming this to be of 97 per cent. purity, the proportions in which the ingredients were mixed is probably as follows:

Cream of tartar	=	64
Superphosphate of lime	=	31
Rice starch	=	5
		100

There is a considerable amount of ingenuity shown in the manufacture of such an article as this, as, although actually containing only 64 per cent. of cream of tartar, when tested by direct titration a result is obtained corresponding to over 90 per cent. This is of course due to the acidity of the added superphosphate.

It is much to be regretted that the compilers of the last edition of the Pharmacopœia, when adopting the method of direct titration of cream of tartar with NaHO, as a test of purity, did not also include at least the determination of the alkalinity of the soluble ash. The employment of these tests in conjunction was advocated by A. H. Allen in the paper already referred to, and it is obvious that a much more satisfactory assay of a tartar can be made when both tests are used than when either test is used singly.

Within the last few years I have had occasion to examine a number of samples of cream of tartar, and among them have found a few containing from 3 to 9 per cent. of tartrate of lime. I have also met with cream of tartar substitutes, which have proved to consist entirely of potassium hydrogen sulphate.

In view of the peculiar composition of this sample, and of the fact that at some time or other it must have been a marketable article, I have thought it desirable to lay the results before you.

ABSTRACTS OF PAPERS PUBLISHED IN OTHER JOURNALS.

FOODS AND DRUGS ANALYSIS.

Estimation of Fat in Food-stuffs. C. Beger. (*Chem. Zeit.*, 1902, xxvi., 112.)—Nerking and Dormeyer have already shown that an extraction with ether for twelve hours is not sufficient to recover all the fat (or matter really soluble in ether) from various kinds of fodder, and that the yield is larger if the substance is treated with pepsin. In order to study the effect of different methods of extraction, the present author has estimated the proportion of fat in a considerable number of food-stuffs in four different ways: (1) By the usual twelve-hour extraction; (2) by two consecutive extractions of twelve hours each; (3) by two consecutive extractions of twelve hours, the material being powdered and mixed up between the two stages; (4) by peptonizing either one of the above residues or the original sample, and extracting with ether both the portion soluble and that insoluble in water. Taking process 1 as the standard, a table accompanying the paper shows that process 2 does not give an appreciably larger yield of fat, the increase ranging between 0·03 per cent. in the case of palm-kernel cake and 0·28 per cent. in that of linseed, while sesamé cake gave an excess of 0·35 per cent. Process 3 gave increases of 0·3 to 0·4 per cent., except in two cases where the yields were practically the same. The peptonizing process led to very different results. If 0·3 per cent. is accepted as the limit of experimental error in a fat determination, many of the samples remained

within that limit, others gave increases of 0·35 to 0·51 per cent.; malt showed an additional yield of 0·7 per cent., then came cottonseed cake, flesh meal, poppy cake, and beer dregs with 1·14 per cent. Rice gluten showed the most noticeable difference, with an increase of 5·74 per cent., so that if the yield by process 1 (0·85 per cent.) is called 100, that by the Dormeyer process becomes 675. Similarly, in the case of beer dregs and malt, the additional amount of fat recovered after peptonization was 12 per cent. and 44·8 per cent. respectively.

The usual qualitative tests were applied to these secondary quantities of fat, and showed them to be really fat, especially in the case of gluten. The extra material obtained from cotton meal was a black resin-like substance, and scarcely deserved the name of fat. F. H. L.

Starch as an Adulterant or Drier in Butter. G. E. Patrick and D. Stuart (*Science*, January 24, 1902) presented, at a recent meeting of the Chemical Society of Washington, the results of some analyses of butter samples which show that notable quantities of starch (probably potato starch) are now being used in this food, presumably as a drier. A tinned butter contained about 15 per cent. of glucose and 3 to 5 per cent. of starch. The presence of small amounts of sucrose was indicated, but as the glucose added to butter is in the form of the syrup, which may contain some added sucrose, the latter is probably accidental. The glucose is added as a preservative, and also to improve appearance. H. L.

A New Method for the Determination of Potato Flour in Yeast. A. Hebebrand. (*Zeit. für Untersuch. der Nahr. und Genussmittel*, 1902, v., 58-61.)—From 0·5 to 1 gramme of the yeast containing potato starch is rubbed down with 20 c.c. of a 7 per cent. solution of sodium hydroxide, and a stream of chlorine is passed through the mixture for one minute at the rate of 4 to 5 bubbles per second; 150 c.c. of distilled water are now added, and the liquid allowed to settle for half an hour. After this time the supernatant liquid, in which the yeast remains suspended, is decanted from the sediment, which is washed three times by decantation with water. The sediment is brought on to a weighed filter, thoroughly washed with water, and then in succession with alcohol, ether, and petroleum spirit. The filter and its contents are dried for an hour at 100° to 105° C. and weighed. The starch is thus obtained as a pure white powder, and, assuming that the added potato flour originally contained 80 per cent. of starch, the method gives accurate results. W. P. S.

The Chemical Analysis of the Apple and some of its Products. C. A. Browne. (*Journ. Amer. Chem. Soc.*, 1901, xxiii., 869-884.)—The composition of the edible or fleshy portion of apples is shown in the following analyses:

	Water.	Reducing Sugars.	Sucrose.	Starch.	Ash.	Acid as Malic.	Marc.
Unripe apples (two analyses)	80·67	6·43	2·84	3·92	0·27	1·14	
Summer apples (six analyses)	85·00	7·10	3·36	1·04 (1 analysis)	0·28	0·68	
Winter apples (twenty-one analyses)	83·16	8·16	4·16	—	0·26	0·59	1·85 (8 analyses)

The starch completely disappears in the ripe fruit. The average amount of cellulose was found to be 0·90 per cent.; of pentosans, 0·50 per cent.; of lignin, 0·40 per cent.; of pectin bodies, 0·40 per cent.; and of proteids, 0·10 per cent.

Apple-juices, ciders, and vinegars gave the following figures on analysis :

	Specific Gravity.	Solids.	Reducing Sugars.	Sucrose.	Free Acid as Malic.	Ash.	Pectin.	Proteids.	Rotation Ventzke, 400-millimetre tube.
Juice from summer apples (five analyses)	1·0502	12·29	6·76	3·23	0·72	0·29	0·12 (4 analyses)	0·03 (4 analyses)	– 26·67
Juice from winter apples (four analyses)	1·0569	13·96	8·57	3·40	0·43	0·27	0·12 (1 analysis)	0·02 (1 analysis)	– 45·15
"Second pressings"	1·0376	9·14	6·87	1·49	—	0·20	—	—	– 31·94
Cider (six analyses)	1·0006	2·34	0·32	—	0·25	0·29	0·04	0·02	– 2·34
Vinegar (four analyses)	1·0184	2·00	0·52	—	0·14	0·44	0·17	0·01	– 2·01

The free acid given above for cider and vinegar represents the malic acid only. The cider further contained 0·61 per cent. of acetic acid, and the vinegar 6·19 per cent. The average amount of alcohol in the ciders was 5·51 per cent. The "second pressings" are obtained by wetting apple pomace with water and re-pressing. This juice is extensively used for jelly-making and vinegar stock.

Other apple products gave results as under :

	Water.	Reducing Sugars.	Sucrose.	Ash.	Free Acid as Malic.	Proteids.	Pectin.	Marc.
Evaporated apples (two analyses)	27·61	32·80	19·02	1·10	4·08	0·87	—	5·53
Apple butter (one analysis)	52·58	37·20	1·14	0·97	2·52	0·25	2·15	1·14
Cider jelly (one analysis)	44·53	49·50	2·18	1·39	3·61	—	1·60	none
Apple pomace (one analysis)	70·76	8·09	2·40	0·49	—	1·25	—	—

W. P. S.

The Bromine Test for Strychnine. J. C. Wharton. (*Journal of Pharmacology*, 1901, viii., 201; through *Chem. Zeit. Rep.*, 1902, 41.)—If the substance is in chloroform solution, it is brought into a small test-tube and placed inside a larger tube charged with boiling water till the solvent has evaporated. The residue, or the original sample, if solid, is then moistened with 2 or 3 drops of 1 : 1 sulphuric acid, put back into its hot-water jacket, and agitated till solution is effected. The mouth of a flask containing bromine is next held over that of the tube, so that the latter may become full of vapour. The tube is well shaken to cause absorption of the bromine, and the excess is driven off by immersion in the hot-water tube. If strychnine is present in considerable quantity, carmine-red vapours will probably appear in a few minutes, increasing in intensity as the bromine evaporates. The colour disappears after a time. If only a little strychnine is present, only a little

bromine should be employed, and the halogen itself may be replaced by a solution containing about 1 drop of bromine in 2 or 3 c.c. of chloroform. F. H. L.

The Identification and Properties of α- and β- Eucaine. C. L. Parsons. (*Journ. Amer. Chem. Soc.*, 1901, xxiii., 885-893.)—These two alkaloids have been recently placed on the market for use as local anæsthetics. They closely resemble cocaine, and are often substituted for this drug.

α-Eucaine, or *n*-methylbenzoyltetramethyl-γ-oxypiperidin carbonic acid methyl ester, forms a hydrochloride when treated with hydrochloric acid, melting at about 200° C., but decomposing at the same temperature; α-eucaine melts at 103° C. The hydrochloride is soluble in 10 times its weight of water, the solubility varying with the temperature. It is soluble in its own weight of alcohol. Potassium iodide gives, in even moderately dilute solutions, a white silky precipitate with α-eucaine salts. β-Eucaine and cocaine give no reaction. Ammonia precipitates α- or β-eucaine or cocaine, but α-eucaine is almost insoluble in excess. Potassium dichromate, in strong solution, throws down a fine yellow precipitate when added to solutions of α-eucaine.

β-Eucaine, or benzoylvinyldiacetonalkamine, melts at 91°, and forms a hydrochloride melting at 268° C. At ordinary temperatures the hydrochloride dissolves to the extent of 3 per cent. in water and about 11 per cent. in alcohol. It is almost insoluble in ether. This comparative insolubility is one of its chief characteristics.

Cocaine may be distinguished from either of the above alkaloids or from both by the following reactions. If a small amount of cocaine hydrochloride be rubbed up with dry mercurous chloride, and then moistened with alcohol, it rapidly turns a grayish black. α-Eucaine hydrochloride slowly becomes dark gray, whilst the β-eucaine salt is not affected. Platinic chloride gives a yellow crystalline precipitate with a 1 per cent. solution of cocaine hydrochloride, which is insoluble in hydrochloric acid. α- and β-eucaine hydrochlorides in 1 per cent. solution yield no precipitate. In stronger solutions a precipitate is formed, which, however, dissolves at once in hydrochloric acid. A drop of potassium permanganate solution is at once turned brown by a drop of the eucaine solutions, whilst with cocaine hydrochloride the colour of the permanganate solution is not changed under half an hour; but it also eventually becomes brown. Excess of permanganate should be avoided. Solutions of cocaine hydrochloride in either water or alcohol polarize light strongly to the left. Eucaine solutions do not polarize light. Cocaine when used in the eye always causes mydriasis. β-Eucaine does not dilate the pupil.

The hydrochlorides are easily identified under the polarizing microscope. α-Eucaine hydrochloride crystallizes in little spots, which under polarized light look like highly-coloured rosettes made of very small crystals, the field never showing any constant extinction directions. β-Eucaine hydrochloride crystallizes in feathery or fern-like forms, sometimes blade-like or tabular. The extinction direction is usually slightly oblique to the main axis of the crystal. Rarely the crystals are diamond shape. Cocaine hydrochloride crystallizes in fanlike shapes. Extinction

is parallel and perpendicular to the main axis of the crystals. The colours are brilliant and the whole field is characteristic.

In other respects, especially with regard to the usual alkaloid reagents, these three alkaloids behave alike. W. P. S.

The Behaviour of Calcium Hypophosphite in the Animal System. T. Panzer. (*Zeit. für Untersuch. der Nahr. und Genussmittel*, 1902, v., 11-14.)—The author has made experiments, both on himself and on dogs, regarding the retention of hypophosphites in the body when taken by the mouth. In the case of dogs it was ascertained that these salts were eliminated from the body, principally by the the urine, in twenty-four hours. In the experiments on himself, the elimination appeared to be rather more protracted. As hypophosphites give the same reaction as phosphorous acid when tested by the hydrogen flame-test, in cases of suspected phosphorus-poisoning, it should be ascertained, if possible, whether the deceased had been taking hypophosphites medicinally immediately before death took place. If none had been administered for two or three days before death, and a reaction be obtained, phosphorus-poisoning may then be suspected. W. P. S.

TOXICOLOGICAL ANALYSIS.

The Detection of Morphia in Decomposing Bodies. T. Panzer. (*Zeit. für Untersuch. der Nahr. und Genussmittel*, 1902, v., 8-10.)—The author found traces of morphia in two corpses, and, for the purpose of ascertaining the stability of morphia in the presence of decomposing matter, kept portions of the bodies for six months (from June to December), morphia being again looked for after this period. The stomachs, portions of the intestines, kidneys, livers, and urine were stored in loosely-covered vessels at the ordinary temperature of the room. Although intense decomposition had taken place, morphia was plainly detected. The following method was employed: The decomposed matter was diluted with water, acidified with tartaric acid, and gently warmed on the water-bath for some hours. After cooling and filtering, the filtrate was evaporated to a syrup, precipitated with alcohol, and again filtered. The alcohol was driven off from the filtrate, the residue dissolved in water, filtered from insoluble matter, and shaken out with ether. The aqueous liquor was then made alkaline with potash and again shaken out with ether. A third extraction with ether was made after acidifying with hydrochloric acid and making slightly alkaline with ammonia. The morphia was now extracted from the liquor by shaking with amyl alcohol. On evaporating the amyl alcohol a brown, sticky residue was obtained. This was dissolved in cold dilute hydrochloric acid and the solution extracted with amyl alcohol, which removed almost the whole of the colouring matter. The acid liquor was rendered alkaline with ammonia and shaken out with acetic ether, which had previously been washed with water. On allowing the acetic ether to spontaneously evaporate, an amorphous residue was obtained, dissolving completely in hydrochloric acid. After

standing, this acid solution deposited crystals which gave the usual reactions of morphia. W. P. S.

Destruction of Organic Matter in Toxicological Analysis. G. Meillère. (*Journ. Pharm. Chim.*, 1902, xv., 97-99.)—The following modification of Gautier and Poutet's methods is stated to effect the complete destruction of 250 c.c. of any organic tissue within two hours.

This quantity of the organic matter is finely divided, and mixed with 5 grammes of potassium sulphate and 100 c.c. of a mixture of 1 part of sulphuric acid and 4 parts of nitric acid. The porcelain basin is next cautiously heated until the organic matter has become liquid, after which a further quantity of the acid mixture is introduced into the centre of it by means of a dropping funnel with a stopcock regulated so that 200 c.c. are delivered within an hour. From time to time 1 c.c. of the liquid is evaporated to dryness, and if the residue turns black the addition of acid must be continued.

According to the author, this method is applicable to the detection of lead, arsenic, copper, and zinc in animal or vegetable tissues.

For the determination of total phosphorus in milk, cereals, lecithin, etc., the following method gives good results, and has the additional advantage of enabling a simultaneous determination of total chlorine and sulphur to be made: The substance is heated with a large excess of pure fuming nitric acid containing 1 per cent. of silver nitrate, which effects a rapid destruction of organic matter. The silver chloride formed is separated, and the excess of silver in the filtrate precipitated with hydrochloric acid. The phosphoric acid can then be precipitated from this filtrate by means of ammonium molybdate. When the sulphur is to be determined the bulk of the nitric acid should first be removed by evaporation. C. A. M.

ORGANIC ANALYSIS.

On Nicloux's Method of determining Alcohol. M. E. Pozzi-Escot. (*Ann. de Chim. anal.*, 1902, vii., 11, 12.)—Nicloux's method is a colorimetric one based upon the reducing action of alcohol upon potassium bichromate in an acid solution (Analyst, xxii., 161 and 263).

The author has made a series of experiments with this method, and finds that all the alcohols met with in fermented liquids behave like ethyl alcohol towards the reagent, and that aldehyde, contrary to Nicloux's assertion, has also a reducing action.

In order to obtain comparable results, even with absolutely pure ethyl alcohol, it is essential to maintain absolutely identical conditions, and even then the author has obtained discordant figures in duplicate experiments. C. A. M.

Detection and Estimation of Anthranilic Methyl Ester. E. Erdmann. (*D. Chem. Ges. Ber.*, 1902, xxxv., 24; through *Chem. Zeit. Rep.*, 1902, 40.)—This

ester has been found in essential oils, and is best determined by the use of such reagents as give azo colouring matters with primary aromatic amines. Any colouring matter soluble in water may be employed—*e.g.*, the combination with β-naphthol-disulphonic acid R—and the operation can be made quantitative by colorimetry. If, however, only small quantities of the ester are present, the author prefers to dilute the diazotized solution to a known volume, and then to titrate it with an alcoholic solution of β-naphthol. The colouring matter thus falls in an insoluble condition, and the end-point of the titration may be ascertained either by "spot" tests or by filtering off a little of the liquid and trying it with both the diazo compound and with naphthol. The precipitate is orange-coloured, dissolving in strong sulphuric acid to a red-violet. Even a few milligrammes of anthranilic methyl ester may be determined in this manner, and the presence of the corresponding compound of methylanthranilic acid does not interfere. F. H. L.

A Modification of Zeisel's Method for the Estimation of Methoxyl Groups. J. T. Hewitt and T. S. Moore. (*Proc. Chem. Soc.*, xviii., 10.)—The authors describe a modification of Zeisel's method, in which the condenser supplied with water at 40° is replaced by a fractionating column. The potash bulbs, containing water and red phosphorus, are dispensed with, and the time taken in fitting up the apparatus and carrying out the operation is much less than in Zeisel's original method. A. G. L.

On the Determination of the Methoxyl-Group in Substances containing Sulphur. Felix Kaufler. (*Monatshefte f. Chem.*, xxii., 1105.)—It is well known that Zeisel's method yields low results when applied to substances containing sulphur. The following method is applicable to those cases in which the methoxyl-group can be removed by saponification—that is, to the esters of methyl alcohol: The substance and 3 to 6 c.c. of solution of KHO (specific gravity 1·27) are placed in a small distilling flask, the side-tube of which communicates with a U-tube containing pieces of pumice heated after soaking in copper sulphate solution, which serves to dry the methyl alcohol. The other end of the U-tube is fitted to a Winkler absorption flask by means of some arrangement which prevents the passing back of the liquid. This flask contains hydriodic acid (specific gravity 1·7), and is connected to the Zeisel apparatus. During the determination a current of purified air is drawn through the whole apparatus, and two small distilling flasks are used as receivers for the methyl iodide, the side-tube of the second of the flasks being connected with the pump.

At the commencement of the operation the air current is started, the U-tube warmed to 80° to 90°, and the Winkler flask cooled by a mixture of ice and salt. The flask containing the substance is then slowly heated, by means of an oil-bath, until a gentle boiling commences, which is allowed to continue until the contents of the flask are dry, or nearly so. The flask is then allowed to cool, a further quantity of solution of KHO introduced, and the heating renewed until the contents of the flask are again dry. The freezing mixture is then removed from the Winkler flask,

which is allowed to stand at the room temperature for half an hour, after which it is carefully heated to 140° to 150°, and kept at this temperature until the methyl iodide has been completely distilled off, the current of air being continuously maintained. Up to this point the determination requires three to four hours; the remainder of the process is exactly as in Zeisel's method.

From the test analyses it appears that the results furnished by the method are satisfactory for all practical purposes. In conjunction with Zeisel's method it might be used to differentiate between saponifiable and non-saponifiable methoxyl-groups.

A. G. L.

The Adulteration of Turpentine with "White Spirit." A. and P. Andouard. (*Journ. Pharm. Chim.*, 1902, xv., 99-101.)—The authors state that the adulteration of turpentine with light petroleum oil is now very prevalent in France, a special product being imported from America for the purpose under the name of "White Spirit."

A specimen of this substance examined by the authors had the following characteristics: Colour, violet-blue fluorescence; specific gravity at 15° C., 0·807; rotation in 200-millimetre tube, −1·2°; boiling-point, 150° to 160° C., leaving a residue of 42 per cent. beginning to boil at 205° C., and having a rotation of −0·2°.

The following results were obtained with a sample of pure turpentine and with six commercial samples thus adulterated:

	Specific Gravity at 15° C.	Residue at 205° C. Per Cent.	Rotation of Original Substance.	Rotation of Residue.
Pure turpentine	0·871	6	−63·1	−6·4°
Turpentine adulterated with white spirit	0·860 to 0·867	16 to 21	−52·2 to 57·3	−8·0° to 9·6°

The authors call attention to the curious fact that the optical rotation of the residue from the adulterated samples was higher than that obtained from the pure turpentine, whilst the contrary was to have been expected.

For a quantitative determination of the added substance, they recommend the destruction of the turpentine hydrocarbons by means of fuming nitric acid, which leaves the mineral oil practically unaltered.

C. A. M.

Chemical Composition of Norwegian Wood Tar. J. A. Mjoen. (*Zeits. f. angew. Chem.*, xv., 97.)—A. The retort tar is made in factories from the sawdust of pine-wood together with some fir-wood. These are soaked in water for some time, then dried. The tar is distilled off in the absence of air, and is a by-product in the manufacture of wood vinegar. The tar is brownish-black to black in colour, has an acid reaction, a penetrating smell, and a specific gravity of 1·07.

B. In the manufacture of charcoal-burner's tar the wood is partially burnt in a furnace through which a current of air passes. Consequently a large portion of the

volatile constituents is lost. In colour it resembles the retort tar. It has a weak acid reaction, an aromatic smell, and a specific gravity of 1·06. In consistency it is thicker than retort tar.

	A. Norwegian Retort Tar made from Sawdust of Firs and Pines.		B. Charcoal Burner's Tar from Gudbrangdalen.		Beechwood Tar from Austria.		Bohemian Pine Tar.	
Aqueous solution ...	—	4·45%	—	5·0%	—	7·2% strongly acid	—	3·7%
Acetone	0·4%	—	0·07%	—	—	—	—	—
Total aldehydes and ketones	—	0·8%	—	0·5%	—	—	—	—
Acetic acid	0·36%	—	0·37%	—	—	—	—	—
Total fatty acids	acids detected: acetic, propionic, butyric, valeric	3·64%	—	1·78%	—	—	—	—
Guaiacol and creosote ...	creosote about 20%	—	creosote not determined	—	guaiacol 10·5%	—	creosote about 7·5%	—
Total phenols and phenol derivatives	—	44·7%	—	21·5%	—	41·0%	—	17·0%
Retene	not detected	—	4·5%	—	—	—	—	—
Pitch	—	20·6%	—	10·1%	—	21·0%	—	29·0%
Total hydrocarbons ...	—	22·5%	of these about 20% aliphatic, 80% aromatic	46·0%	—	18·0%	—	40·0%
Esters	—	—	1·4%	—	—	—	—	—
Alcohols	methyl alcohol detected: allyl alcohol	about 1·0%	—	—	—	—	—	—

The author's object was to ascertain the actual composition of the tars, not what substances could be obtained from them. Care was therefore taken to protect them as far as possible from the action of heat, air, and light.

The tar was distilled under reduced pressure, the distillate being divided into two portions—light and heavy wood oil. From each portion some aqueous solution separated. In that which separated from the light oil acetone was determined by conversion into iodoform and weighing. The iodoform obtainable from the other aqueous solution was similarly determined, and the aldehydes and ketones in the oils were estimated by known methods. The acetic acid was determined by titrating another portion of the first aqueous liquid with standard caustic soda. The phenols and the fatty acids were extracted from the different fractions by appropriate treatment with various bases. After the aldehydes, ketones, fatty acids, and phenols had been removed, the hydrocarbons and other neutral bodies remaining were washed with water and weighed. The esters were determined in these by saponification with alcoholic potash, evaporating, dissolving in water, acidifying, and weighing the acids precipitated. The creosote was apparently determined by fractional distillation at atmospheric pressure, the portion coming over between 200° and 220° C. being collected and weighed. A. M.

On the Use of Millon's Reagent. O. Nasse. (*Pflüger's Archiv*, 1901, lxxxiii., 361-368; through *Zeit. für Untersuch. der Nahr. und Genussmittel*, 1902, v., 14-15.)—The author uses an aqueous solution of mercuric acetate instead of mercuric nitrate, adding a few drops of a 1 per cent. solution of sodium or potassium nitrite. The solution is usually sufficiently acid in itself, but a little dilute acetic acid may be added if necessary. The presence of nitric acid is unnecessary, and the action is to be considered a nitroso-reaction rather than a nitration. The reaction is retarded by hydrogen peroxide, by the presence of too much chloride, and by alcohol, which latter, however, can be added after cooling without influence. With the simple hydroxylated benzene derivatives, and those in which only one hydrogen atom has been substituted, the reagent as prepared by the author gives different colorations. The ortho compounds yield a brown-red colour, the para compounds blue-red to blue, and the meta compounds various tints. Albuminous bodies and their decomposition products, tyrosin, and the derivatives of *p*-cresol give the blue-violet para reaction. Almost all phenols and salicylic acid give the para reaction. The conversion of ortho into para oxybenzoic acid by fusion with potassium hydroxide can be shown by the reagent, the former being coloured red-brown, and the latter blue-red.

The phenol-aldehyde reaction has been recommended by Denigès (*Compt. Rendu*, 1900, cxxx., 583) for the detection of tyrosin, and the author finds that when this body is gently warmed with 2 to 3 c.c of a mixture of concentrated sulphuric acid with a few drops of formaldehyde, the solution is coloured red-brown, which changes to green on the addition of glacial acetic acid. The three hydroxybenzoic acids give a similar red-brown colour, but these are not turned green by glacial acetic acid.

W. P. S.

INORGANIC ANALYSIS.

Assay of Zinc Precipitates for Gold and Silver. C. Fulton and C. Crawford. (*Eng. and Mining Journ.*, 1901, lxxii., 813; through *Chem. Zeit. Rep.*, 1902, 13.)—Ordinary assay processes are useless here, much of the gold and silver being lost by volatilization and in the slag. The crucible test gives the highest average results for gold, but not for silver, and the loss in the slag varies even when the same conditions are maintained. The best proportions for the crucible test are: 1 to 10 assay-tons of zinc precipitate, 70 grammes of litharge, 5 grammes of sodium carbonate, 1 gramme of fluorspar, 5 grammes of quartz, and 2 grammes of borax. Of combined wet and dry methods, extraction with nitric acid is not satisfactory, owing to dissolution of gold. The authors, therefore, recommend the following: 1 to 10 assay-tons of the sample are boiled for one hour with 20 c.c. of strong sulphuric acid and 60 c.c. of water, cooled, and diluted to 100 c.c.; 75 c.c. of a solution of rock-salt and 20 c.c. of one of lead acetate are added, and the precipitate, after settling for one hour, is collected and dried. This, with the filter ash, is cupelled with 30 or 40 grammes of lead. The results are good and very uniform: the gold is a little lower than that given by the crucible process, but the silver is higher. The loss in the slag is rela-

tively small; but this slag and the cupel may be examined subsequently, and the necessary correction made. The sulphuric acid must be free from nitric acid.

F. H. L.

Volumetric Estimation of Bismuth in Ores. **A. W. Warwick and T. D. Kyle.** (*Eng. and Mining Journ.*, April 13, 1901; through *Chem. News*, 1902, lxxxv., 3.)—One gramme of the finely-powdered ore is evaporated to dryness with 5 or 10 c.c. of strong nitric acid; another 5 c.c. of acid and 25 c.c. of water are added, and the whole is diluted to 100 c.c. Five grammes of ammonium oxalate or oxalic acid are introduced, boiled for five minutes, allowed to settle, and the supernatant liquid filtered off. The precipitate is boiled twice with 50 c.c. of water, and the washings are passed through the same paper. With an ordinary 10 per cent. ore this treatment should suffice to convert the bismuth oxalate into the basic salt; but if the filtrate is still acid, boiling must be repeated to neutrality. The precipitate on the paper is then dissolved in 2 to 5 c.c. of 1 : 1 hydrochloric acid, receiving the liquid in the beaker containing the bulk of the basic oxalate; this is warmed till entirely dissolved, and then diluted to 250 c.c. with hot water. The solution is neutralized with ammonia, and the resulting precipitate taken up in 1 : 4 sulphuric acid, adding a few c.c. in excess. Finally the liquid is titrated at between 70° and 100° C. with permanganate. A permanganate solution in which 1 c.c. = 0·010 gramme Fe, will be equal to 0·0186 gramme bismuth; by diluting 100 c.c. of this with 86 c.c. of water a solution of permanganate will be obtained, of which 1 c.c. should equal 0·010 gramme of bismuth. A permanganate solution 1 c.c. = 0·010 gramme Fe; found = 0·01868 gramme Bi. 100 c.c. permanganate above + 86 c.c. of water; 1 c.c. found = 0·01017 gramme Bi. Lead, iron, copper, zinc, arsenic, and tellurium do not interfere with the process. Care must be taken to avoid using too little or too much nitric acid. Hydrochloric acid must not be used to dissolve the ore. The results are accurate enough for all commercial work, and an analysis can be carried out in thirty or forty minutes. The figures quoted show maximum errors of − 0·0032 and + 0·001 gramme in determining 0·5 gramme of bismuth in presence of lead, copper, zinc, iron, and arsenic.

F. H. L.

Precipitation of Ferrous Sulphide by Means of Sulphuretted Hydrogen. **A. Coppadoro.** (*Gazz. Chim. Ital.*, 1901, xxxi. [2], 217; through *Chem. Zeit. Rep.*, 1902, 40.)—The author points out that when sulphuretted hydrogen is led through a ferric solution, the sulphur which is deposited carries down with it a small quantity of ferrous sulphide, as may be shown by extracting the precipitate with carbon bisulphide. A small amount of ferrous sulphide is also obtained when a solution containing sodium thiosulphate and ferric chloride is treated with an acid. The indispensable condition for the formation of the ferrous sulphide is the simultaneous separation of sulphur.

F. H. L.

Action of Certain Reagents on Free Silicon. P. Lebeau. (*Bull. Soc. Chim.*, 1902, xxvii., 42-44.)—A series of experiments are described in detail, which show that the reagents usually employed to dissolve steel, etc., are without action upon free silicon, even when in a fine state of division, and that that element will be left in the undissolved residue. C. A. M.

The Determination of Persulphates. Charles A. Peters and Seth E. Moody. (*Zeits. anorg. Chem.*, xxix., 326.)—The authors have been induced to make a comparison of the various methods for the estimation of persulphates by the appearance of a paper by Namias (abstract, *Chem. Centrbl.*, 1900, ii., 806), in which the method of Le Blanc and Eckardt (*Zeitschr. Electrochem.*, v., 355) is stated to be inaccurate. In this method the solution of the persulphate is treated with an excess of a standard solution of ammonium ferrous sulphate, either for ten minutes at temperature of 60° to 80°, or for eleven hours at room temperature, and the excess of ferrous salt titrated with standard permanganate solution. Both modifications of the method gave accurate and concordant results, and experimentally it was found unnecessary to replace the air in the titrating vessel by carbon dioxide.

In Grützner's method (*Chem. Centrbl.*, 1900, i., 835) the solution of the persulphate is heated to boiling with a standard solution of arsenious acid, and potassium or sodium hydroxide, cooled, acidulated with sulphuric acid, and made alkaline with potassium bicarbonate; the excess of arsenious acid is then determined with a standard iodine solution. This method also was found to give reliable results, provided that the small amount of arsenious acid oxidized by the reagents added was determined, and this correction applied in calculating the results.

In Mondolfo's method (*Chem. Zeit.*, xxiii., 699) the persulphate solution is heated with potassium iodide in a closed bottle in a water-bath to 60° to 80° for a short time, and the liberated iodine titrated with thiosulphate. There appeared to be a tendency towards low results with this method, but good results were obtained when the volume was kept small (25 c.c.) and the time of heating increased up to thirty minutes (for 0·12 gramme persulphate).

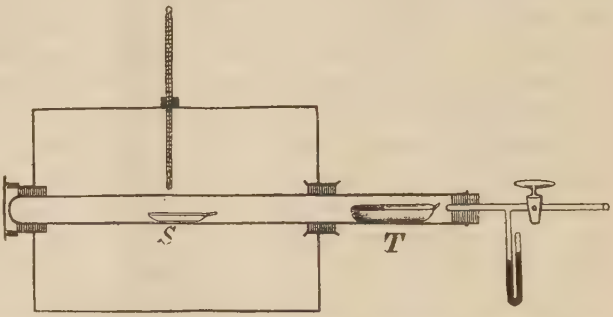
The method described by Namias (*loc. cit.*) differs from Mondolfo's only in the fact that the mixture of persulphate and iodide is allowed to stand for eleven hours at room temperature instead of being heated for a short time. This method also was found to give low results unless the volume of the solution is kept small. In neither of the two last methods is the addition of sulphuric acid advantageous.

Gooch and Smith's method (*Journ. Sci.* [*Sill.*], 42, 220) for the estimation of chlorates was also used for persulphates as follows: To the solution of the persulphate an excess of a standard solution of potassium iodide and an excess of acid potassium arsenate are added, the whole made strongly acid with sulphuric acid, diluted, and boiled down to a third of its volume; after cooling, the solution is made alkaline with potassium bicarbonate, and the residual arsenite titrated with iodine. The difference between the amount of iodine required and the amount contained in the potassium iodide added originally corresponds to the persulphate present. The results obtained were accurate, and agreed well with those obtained by the other methods.

In conclusion, the method of Le Blanc and Eckardt appears to be simple, rapid, and accurate, and furnishes results lying between those given by the other methods, Mondolfo's and Namias's methods giving the lowest, and Grützner's and the arsenate method the highest results, the extreme difference being about 1·5 milligrammes on 0·12 gramme. A. G. L.

APPARATUS.

A Simple Apparatus for Drying Substances under reduced pressure at any required Temperature. F. Pregl. (*Zeit. anal. Chem.*, 1901, xl., 781-785.)—The device shown in the figure is of use, not only for drying hygroscopic substances, but is also particularly suitable for determining the water of crystallization of crystals. As a rule, substances are dried to constant weight within half a day.



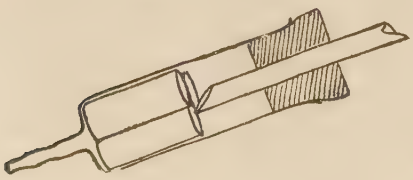
It consists of a thick glass tube about 41 centimetres in length and 20 millimetres in diameter, which is passed through side tubulures in a drying oven and kept in position by corks.

The substance to be dried is placed in the boat *S*, whilst the drying material (phosphorus pentoxide, sulphuric acid on pumice-stone, etc.) is contained in the larger boat, which is wrapped round with copper foil to guard against possible spirting.

The open end of the tube is closed with a rubber cork, through which is passed a tube with a mercury manometer and stopcock. After exhausting the air in the tube by means of a pump the stopcock is closed, and the tube heated to the required temperature, any leakage of air through the cork being indicated by the manometer.

C. A. M.

Receiver for Fractional Distillation under Diminished Pressure. W. Burstyn. (*Oesterr. Chem. Zeit.*, 1901, iv., 563.)—The three small tubes which serve as actual receivers are lightly held together by means of a rubber ring, and they are dropped into the larger tube as shown. By having the end of the condenser tube slightly bent, its orifice can be brought opposite the mouth of each of the small receivers in succession by simply rotating the outer vessel on its rubber cork. The tube at the lower end of the main vessel leads to the pump. The rubber cork should be lubricated with strong pure glycerin, which is better than



collodion, as it does not attack the rubber, has no appreciable vapour tension, and can be quickly washed off with water. F. H. L.

Laboratory Appliances. R. Gnehm. (*Zeits. f. angew. Chem.*, xiv., 1208.)—Fig. 1 shows a simple mill for pulverizing solid bodies, treating cellulose with strong soda lye, etc. The iron tube A, about 100 millimetres in diameter, is at either end screwed to the two brass plates, C_1C_2, which are provided with extensions, D_1D_2, that act as an axle and rest in the supports E_1E_2. To introduce or remove the substance the plate C_2 is unscrewed. At the same time a number of iron cylinders, W, or balls, K, are introduced. The drum is turned by means of the pulley F.

For operations which require continual stirring, together with heating under an inverted condenser and the introduction of liquid, the appliance shown in Fig. 2

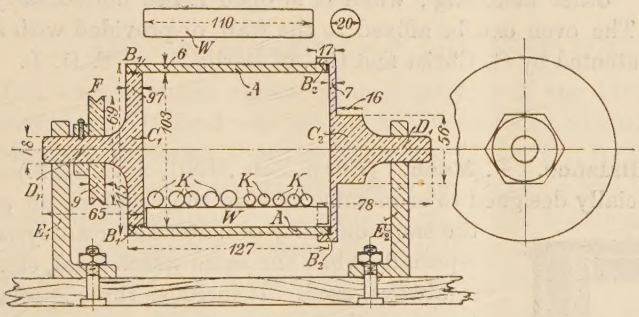


Fig. 1

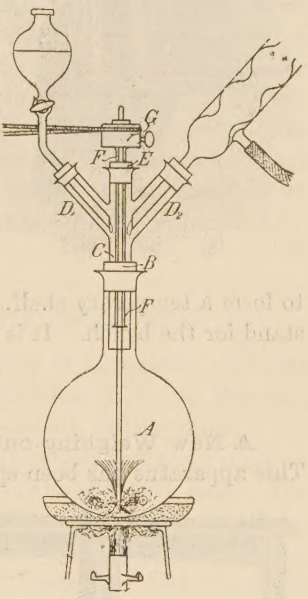
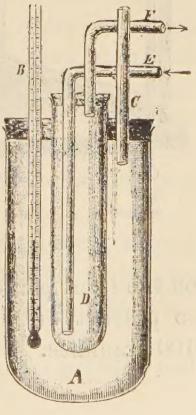


Fig. 2.

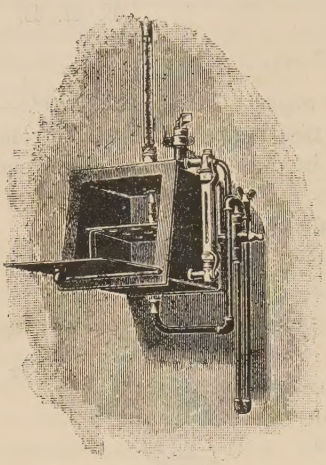
may be used. The stirrer is driven from the pulley G and rotates in the tube F, which is made of glass or metal, and is fixed by means of the cork E into the appliance. A. M.

Apparatus for Sublimations. C. Nicolaysen. (*Chem. Zeit.*, 1901, xxv., 1031.)—This apparatus consists of a boiling-tube about 6 centimetres in diameter, inside which a narrower tube is supported, as shown by the sketch. Tubes E and F serve for the entry and exit of cooling water into the inner tube. C is open at both ends. Small quantities of materials can be safely deposited on the outside of D without danger of the sublimate dropping; if it be desired to collect larger amounts, a small basin might be slung under D so as to collect any falling matter.

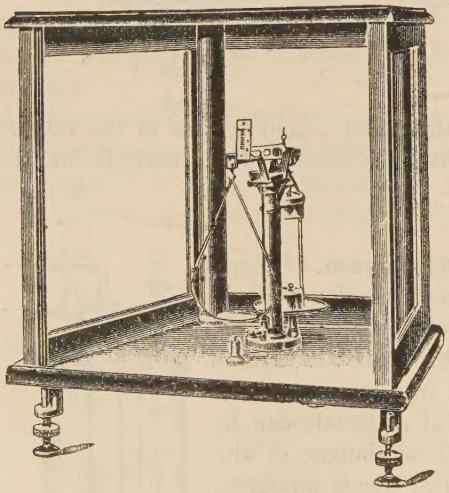
F. H. L.



A Drying Oven for Temperatures exceeding 100° C. (*Chem. Zeit.*, 1901, xxv., 1086.)—This is an apparatus which can be set to give any desired temperature up to 105° (or even 110°, if necessary), working with pure water boiling under pressure. The thermostat shown on the right of the oven in the diagram contains about 140 grammes of mercury, and is so constructed that when the temperature, and therefore pressure, rises to the predetermined point, the mercury cuts off the gas supply, leaving only a pilot flame alight. By introducing small extra quantities of mercury into the tube the maximum temperature can be lowered by a degree at a time. A brass-jacketed gauge-glass is also fitted at the side. On the top is a valve which admits air to the steam space when the oven is cold. The front slopes as shown, so that the door needs no latch or other fastening; when it is open it lies horizontally to form a temporary shelf. The oven can be affixed to the wall, or provided with a stand for the bench. It is patented by G. Christ and Co., of Berlin. F. H. L.



A New Weighing-out Balance. F. Mach. (*Chem. Zeit.*, 1901, xxv., 1139.)—This apparatus has been specially designed to economize time in the weighing off of the same quantity of material for analysis, especially when the same watch-glass, etc., is always used. It includes three special features: the beam is placed end-on in the case; the beam is a "steel-yard," the lengths of its two portions having the ratio 10 : 1; and the arresting gear is automatic. The rear pan carries the weight, which represents (ten times) the net quantity of substance, the receptacle at the top of the stirrup being intended to hold the counterpoise of the watch-glass. The arresting gear of the beam is so arranged that it carries the rear pan with counterpoise and weight; and only when one-tenth or more of the substance which has to be weighed is put into the watch-glass on the front pan does the steel-yard beam come into play. Both pans have stops to prevent oscillation. The delicacy of the balance exceeds 1 milligramme per 100 grammes. It is made by W. Spoerhase, of Giessen. F. H. L.



On the Sensitiveness of a Thermo-regulator. A. W. C. Menzies. (*Proc. Chem. Soc.*, xviii., 8.)—With the arrangement described below, the temperature of the bath could be kept constant at 18° within a total range of 0·008° C. The glass "horseshoe" reservoir was of the usual form, having a capacity of 390 c.c. and an outer surface of about 650 square centimetres; the ordinary U-form regulating tube containing mercury was fused on to this reservoir, all the tubes containing enclosed liquid being placed in the water of the bath. Toluene being used for the expanding liquid, the stopcock closing one limb of the U-tube was lubricated with syrupy phosphoric acid. The bath held 14 litres, and was of enamelled iron, with no jacket. The stirrer was driven by a small electromotor, some of the vibration being communicated to the regulator to aid the free movement of the mercury. The gas-supply was regulated so that the by-pass flame was nearly sufficient to maintain the temperature. A tube of 3·1 millimetres bore was used for the outer limb of the regulator, and ordinary unfiltered coal gas was used. For narrower tubes the gas should be filtered and dried. A bore of 1·9 millimetres for the outer limb gave a temperature variation of not more than 0·0025°. A. G. L.

ANNUAL MEETING OF THE INSTITUTE OF CHEMISTRY.

The twenty-fourth annual general meeting of the Institute of Chemistry of Great Britain and Ireland was held at 30, Bloomsbury Square, London, W.C., on Monday, March 3, Professor J. Millar Thomson, LL.D., F.R.S., President, in the chair.

The ordinary annual business of the Institute was transacted, and the President delivered an address dealing with work of the Institute during the past year. The roll of members has increased by 36, making the total of 1,040 Fellows and Associates at present on the register, while there are 130 students in course of training at the colleges and institutions recognised by the Council of the Institute. The President remarked on the higher percentage of passes in the recent examinations, which he considered pointed to the fact that the thoroughness of the examinations was more fully realized by those preparing for them.

He also mentioned the establishment of an examination in biological chemistry, by means of which the Council hope to encourage analytical chemists to pursue the study of bacteriology, and thus be able to deal with chemical work involving bacteriological knowledge. The examination is specially suited for such as intend entering the practice of chemistry in its relationship to the chemistry and bacteriology of food, water, sewage, and effluents, and the practical applications of biological chemistry to such industries as brewing, tanning, etc. He called attention to the fact that the Institute held an examination in Ireland in July last, and that the Council hope in future to arrange for a regular examining centre in Dublin.

During the past year the Council have ceased to recognise the junior, second class, and lower grade professional preliminary examinations of various examining bodies, and they have now under reconsideration the subjects which shall be compulsory to persons intending to proceed to the examinations of the Institute.

The Council also reported to the members that during the past year they had

addressed to the Local Government Board, and to various county and borough authorities, communications with reference to the combination of the two appointments of Medical Officer of Health and Public Analyst. It has been pointed out that a Public Analyst requires special training and experience in analytical chemistry far beyond that which is usually acquired by medical practitioners in the course of their professional education; also, that where the appointments are proposed to be combined, the selection of candidates for both positions is necessarily limited. The Council hold the opinion that under the provisions of the Sale of Food and Drugs Act of 1875 it was intended that the Medical Officer of Health and the Public Analyst for a borough or district should be two distinct persons, inasmuch as the Medical Officer is one of those officers empowered by the Act to submit suspected samples for analysis. The qualifications and examinations of the Institute are accepted by the Local Government Board for public analytical appointments, and it is the desire of the Council that no lower standard of chemical training and experience than that prescribed by the Institute of Chemistry should be accepted for such important and responsible public appointments as those of Public Analysts under the Sale of Food and Drugs Act.

REVIEWS.

THE COMPOSITION OF DUTCH BUTTER. By Dr. J. J. L. VAN RIJN. London: Baillière, Tindall and Cox, 1902.

This book contains a very large number of exhaustive analyses of butter from farms in Holland, which were expected to yield abnormal figures, and they are ably discussed. Two main facts are stated: Firstly, that genuine butters may give a Reichert-Wollny figure of 19, 18, or even 17; and, secondly, that a "rise [in Reichert-Wollny figure] begins shortly after the cows have been stabled."

The first fact, which has been known for years, is liable to great misinterpretation, and more than one person has acquired the idea that "50 per cent. of all Dutch butters" fall below 25 c.c. Reichert-Wollny. Read with proper understanding, this book shows nothing of the kind, and the author would probably be the first to admit this. The second fact, which has received confirmation, points to the remedy for low Reichert-Wollny figures, and shows that, were a reasonable standard prescribed, it would be but a matter of organization to comply with it. H. D. R.

FOOD AND DRUGS. A Manual for Solicitors, Public Analysts, Inspectors, etc.; being a Consolidation of the various Food Acts. By CHARLES JAMES HIGGINSON. Second edition, revised and enlarged. London: Effingham Wilson, 11, Royal Exchange.

The first edition of this most useful little book appeared in 1900. It has met with well-deserved appreciation, as shown by the need for a second edition. This has been brought quite up to date, references to "milk-blended butter" and to the Board of Agriculture Milk Regulations being included. The list of High Court decisions is very complete, and copious and well-arranged indices render reference easy.

Among the many legal works on the Food Acts none deserves a place in the Public Analyst's library more than Mr. Higginson's. O. H.